Makoto NISHIDA* & Siro KURITA*: *Ophioglossum parvum*, a new species from warm temperate zone of Japan**

西田 誠*・栗田子郎*: ハナヤスリ属の1新種チャボハナヤスリ

In the autumn of 1973, Mr. Yoshio Shimura, Professor Emeritus of Shizuoka University, found small plants of *Ophioglossum* on a graveyard in Nishioka, Kakegawa City, Shizuoka Prefecture and sent several specimens to the senior author asking to examine them. These specimens are slender with very small trophophylls, less than 7 cm in height and seemed to be a new species at a glance, though it is difficult to distinguish the present specimens strictly from the small type of *Ophioglossum thermale* var. *nipponicum* Nishida which is widely distributed in central Japan. In 1975, junior author could collect living materials at the same locality led by Mr. Shimura in order to examine chromosome number and ornamentation of spore coat. For we believed these features might be available as diagnostic characters of *Ophioglossum* species (Nishida, 1959; Kurita and Nishida, 1965).

In the course of our study on the materials from Shizuoka Prefecture, in November of 1976, Mr. Norio Sahashi, Toho University, kindly gave us the other materials which resemble closely the previous ones and were collected in Isl. Aogashima, southernmost of Izu Islands. We have examined the sculpture of spore coat, chromosome number, venation and epidermis on both specimens comparing them with those of some related East Asiatic species of *Ophioglossum*.

Methods: We peeled epidermis of under surface of trophophyll and mounted it in slide glass by glycerin in order to measure stomata. Measuring numerical value has been demonstrated by mean value (M) of a hundred of stomata and its standard deviation (S). Equatorial diameter of spores was measured under the optical microscope and it has been demonstrated also by the mean value and the standard deviation of 50 spores which were

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collected from each spike. Ornamentation of exine was observed and photographed by SEM under 15 kv of acceration voltage after coating spores with gold. Chromosomes were examined by the methods applied to the previous paper (Kurita and Nishida, 1965). As for examination of venation, we have used decolorized trophophylls by immersing them in 70% aquatic solution of ethyl alcohol. As for the material which were not decolorized completely by the above treatment, they were treated by commercial bleaching reagent.

General observation: The specimens from both areas, Shizuoka prefecture and Isl. Aogashima, closely resemble *O. thermale* var. *nipponicum* in gross morphology except for extremely small size of plant in the former (Fig. 1). Plants are 5-8 cm high, slender and less than 1 mm in diameters of petioles. Most of the plant height depends on the height of sporophyll which ranges sometimes to 7 cm in height. Sporophyll consists of stipe ranging between 4 cm and 6 cm in height and spike ranging between 0.7 cm and 1.0 cm in length and 0.4 mm and 0.5 mm in width. Spike bears 8-12 pairs of sporangia. As the phyllomophores, so-called common stalks, are

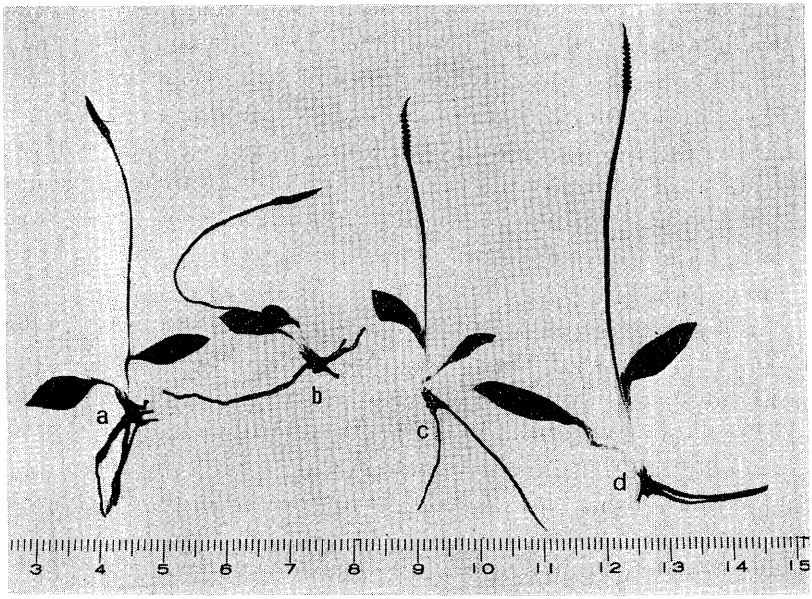

Fig. 1. Xeroxed silhouettes of *O. parvum*: a, b. Plants from Kakegawa. c, d. Plants from Isl. Aogashima.

less than 1 cm long and immersed under the ground, the laminae of trophophylls contact directly to the ground surface. The rhizome is usually more or less tuberously thickened and generally distinguishable from typically cylindrical form of *O. thermale* var. *nipponicum*. The laminae of trophophylls are less than 1.5 cm long, 2-5 mm wide and never oblong nor elliptical as in *O. thermale* var. *thermale* and *O. thermale* var. *nipponicum* but always lanceolate, usually acute in apices and sessil or very shortly petiolate, less than 1 mm long, attenuately terminate to the stipe.

The secondary blind veinlets in the primary areoles in venation are hardly observed in the trophophylls. Three or four parallel vascular strands enter the stipe of the trophophyll. *O. thermale* var. *nipponicum*, on the other hand, form always secondary blind veinlets, though it is not so conspicuous as that in *O. petiolatum* (cf. Nishida, 1959). The vascular supply for the stipe in *O. thermale* var. *nipponicum* consists usually of 7-8 parallel strands (Fig. 2).

Although the outline of epidermal cells varies little by little according to the grade of leaf growth, matured epidermal cells of the materials from Shizuoka Prefecture and Isl. Aogashima exhibits the same type as in *O. thermale* var. *nipponicum* (Fig. 3). Similar type of epidermis was observed in *O. lusitanicum* and *O. fibrosum* from India (Maróti, 1965). Measured numerical value from a hundred stomata is M=57.7 μm and S=6.2 μm in the materials from Shizuoka Prefecture and M=57.3 μm and S=4.5 μm in the materials from Isl. Aogashima. These values are indistinguishable from that of *O. thermale* var. *nipponicum* from Torami, Chiba Prefecture in which M=55.9 μm and S=3.0 μm with chromosome number 240 in haploid phase, though they are less than that of *O. thermale* var. *nipponicum* from Narita, Chiba Prefecture in which M=64.1 μm and S=5.5 μm with chromosome number 480 in haploid phase.

Measured numerical value of equatorial diameter of the spores from Shizuoka Prefecture is M=31.0 μm and S=2.3 μm and that of the materials from Isl. Aogashima is M=32.5 μm and S=2.4 μm. We could not find out any significant difference between both materials. Sahashi (1977) reported already similar numerical value in the same materials as we did. In *O. thermale* var. *nipponicum*, on the other hand, equatorial diameter of spores of individuals with 240 chromosomes in haploid phase is M=36.4 μm and

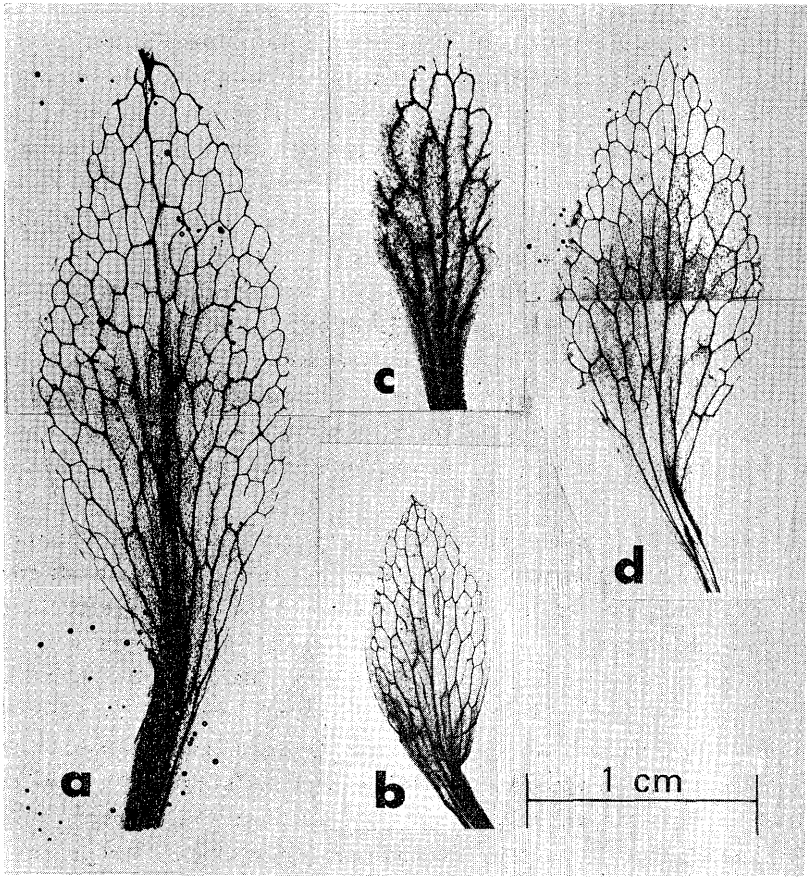

Fig. 2. Venation pattern of fronds in *O. parvum*: a, b. Plants from Isl. Aogashima. c, d. Plants from Kakegawa.

S=2.5 μm, and those of specimens with 480 chromosomes in haploid phase is M=38.5 μm and S=3.4 μm.

We could not find any difference between the materials from Shizuoka Prefecture and those from Isl. Aogashima in the pattern of sculpture of spore coat. Basic pattern of sculpture is reticulate as Sahashi (1977) also pointed out already, though size of lumen and the developmental grade of muri are, however, variable; namely ranging between oververmiculate and vermiculate (Fig. 4). In addition the small hole is usually seen in the central

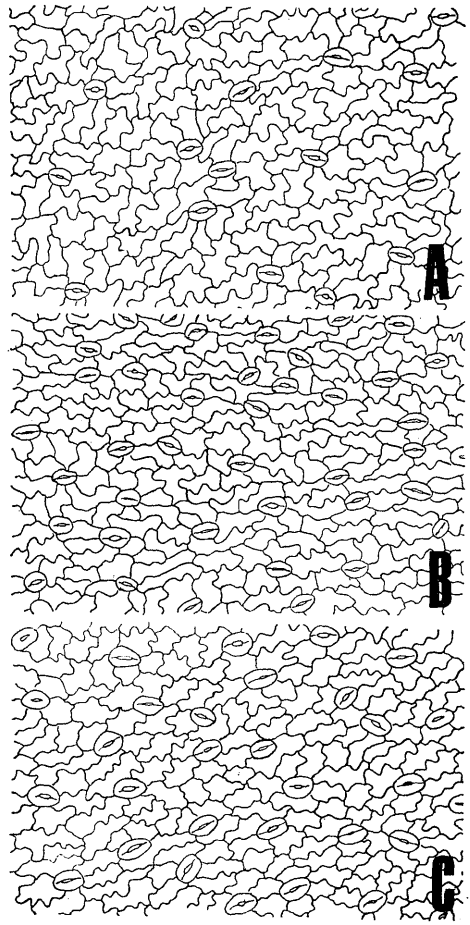

Fig. 3. Leaf epidermis. A, B. *O. parvum*. C. *O. thermale* var. *nipponicum*. × ca. 80.

part of hollow bottom of lumen. These small hole seems not to perforate spore coat, though they appear like the pit under the optical microscopy. Such sculpture pattern as seen in the present specimens is not different fundamentally from those of *O. thermale* var. *nipponicum* and *O. thermale* var. *thermale*, but can be distinguished from those of *O. petiolatum* and *O. namegatae* and also from those of *O. vulgatum* (cf. Nishida, 1959).

The present specimen is similar to *O. nudicaule* in gross morphology

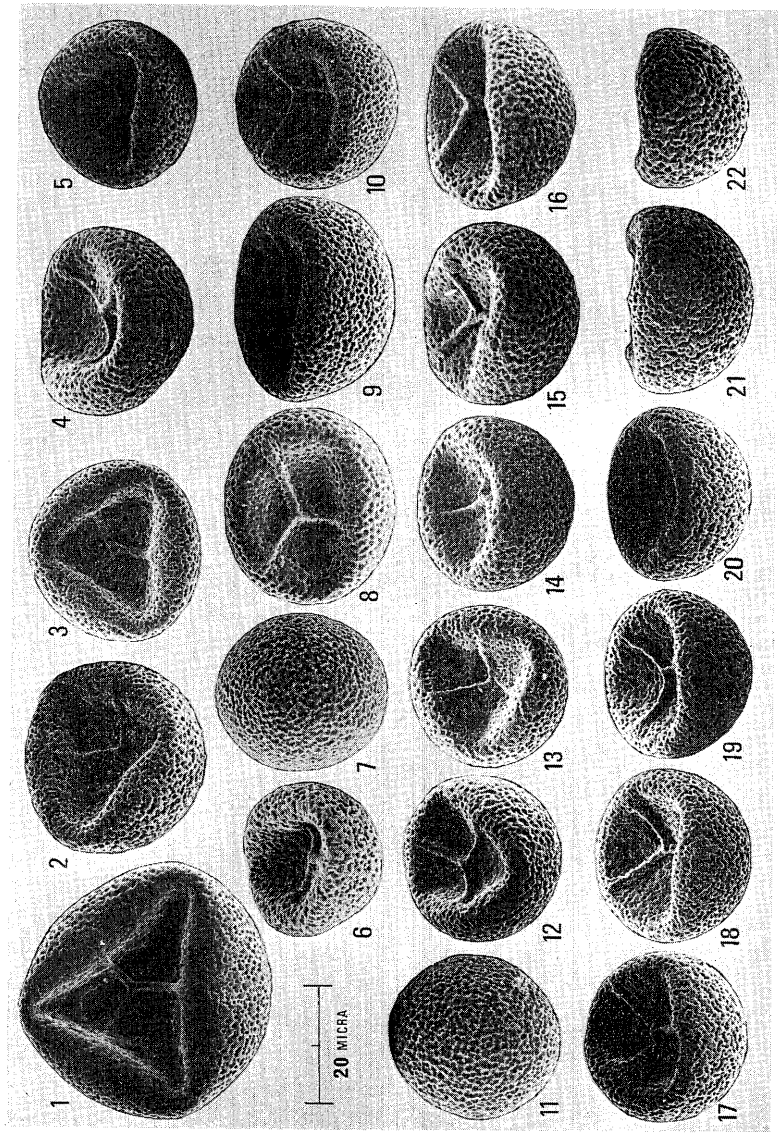

Fig. 4. SEM micrographs of intact spores of *O. parvum*. 1 to 10 are from Kakegawa, and 11 to 22 are from Isl. Aogashima.

and its somewhat tuberous rhizome, but differs from the latter in the pattern of sculpture of spore coat; the latter exhibits similar pattern as in *O. vulgatum* under the optical microscopy (Nishida, 1959).

Concerning the chromosome number, the present plants from both Nishioka and Isl. Aogashima have 120 chromosomes in haploid phase instead of 240 or 480 in *O. thermale* var. *nipponicum* (Fig. 5). This is the smallest number in the genus so far as we know and the first record in the Japanese species, though Indian species, such as *O. Aitchisonii* (Ninan, 1958), *O. costatum* (Ninan, 1956), *O. gramineum* (Ninan, 1958), *O. nudicaule* (Ninan, 1958), and *O. polyphyllum* (Verma, 1957) exhibit the same number as that of the present specimens. Only one nucleolus and 7-8 small dumbbell shaped bivalent chromosomes are usually observed in the present materials. Out of above five Indian species, four species except for *O. nudicaule* which exhibits unique pattern of spore coat are different from the present materials in gross morphology and venation etc.

Result: As mentioned above, the present specimens are characteristic in having following features: 1. Plants are very small and slender. 2. Trophophylls are typically acute in apices. 3. Phyllomophores are very

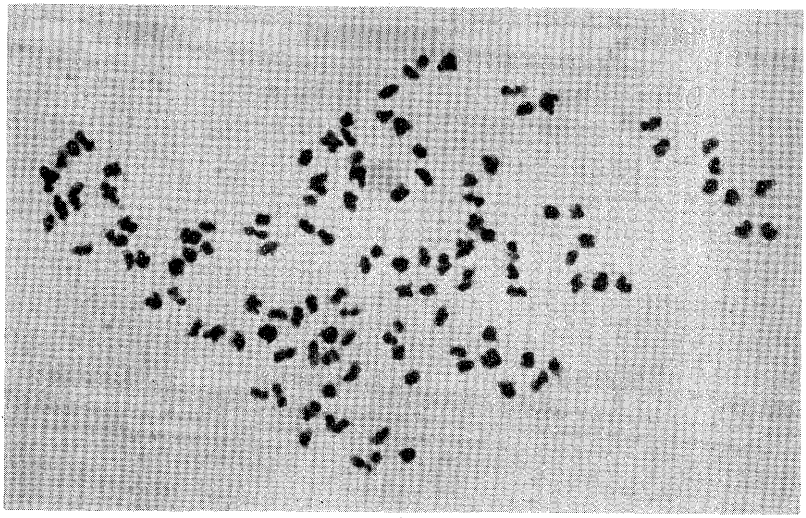

Fig. 5. A spore mother cell of *O. parvum* at the first meiotic division, showing 120 bivalent chromosomes. ×ca. 680.

short and almost subterranean. 4. Spores are smaller than those of *O. thermale* var. *nipponicum*. 5. Rhizomes are more or less tuberous. 6. Secondary veinlets are hardly formed. 7. chromosome number is 120 in haploid phase. The present specimens, therefore, would represent a new species relating closely to *O. thermale*. Moreover, the specimen collected by Mr. K. Kawasaki at Yokkaichi City in 1905 and preserved in Makino Herbarium seems to be the same species.

Ophioglossum parvum Nishida et Kurita, sp. nov.

Planta toto parva, 4-7 cm alta, rhizomate vulgo plus minusve tuberanti vel saepe breviter erecto cylindrico, exquo in quotannis frondes (ex Maio ad November crescentes) vulgo numero 2-3 prodeuntes. Phyllomophorum breve, brevius quam 1 cm longius, paene subterraneum. Trophophyllum 0.5-1.5 cm longum 0.3-0.5 cm latum, anguste lanceolatum vel ellipticum, margine integrum, apice acutum vel acuminatum, basi attenuatum, sessile vel brevi-petiolatum, petiolo 0.5-1.0 cm longo, costa basi tenui sursum indistincta, venatione areolis magnis, vulgo sine venula secunda vel raro eam inclusis. Sporophyllum gracile, lineare, 3.5-6.0 cm longum, 0.5 cm diametro, longe pedunculatum, spica 0.7-0.9 cm longa 0.9-1.1 cm lata. Sporangia 0.4-0.7 mm diametro, numero 8-12 utrimque ad spicam, uniseriatim disposita. Sporae tetrahedricae, 27-31-43 μm diametro aequatorio, sculptura exini minute sub-reticulata. Chromosomatis numerus n=120.

Hab. Honshu, Japan; Pref. Shizuoka: Nishioka, Kakegawa City (Yoshio Shimura, 1973, no. 76001 holotype, no. 76002, Chiba Univ.) Pref. Mie: Yokkaichi City (Kojiro Kawasaki, 1905, no. 116-6 in MAK). Izu Islands, Japan; Isl. Aogashima (Norio Sahashi, 1976, no. 76003-76004, Chiba Univ.).

The authors wish to express their hearty thanks to Mr. Yoshio Shimura for his kindness in giving us material from Kakegawa City and guiding the junior author to the locality. They also wish to thank Dr. Kankichi Sohma, Tohoku University, for his good suggestions on spore morphology given in the course of the study. Gratefulness is also due to Mr. Norio Sahashi, Toho University, who gave us the precious materials from Isl. Aogashima.

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西田は1975年の秋，当時静岡大学教授であられた志村義雄氏から，掛川市内の墓地で採集された小型のハナヤスリの同定を依頼された。志村氏によりエンシュウハナヤスリと仮称されていたこの植物は ①染色体数が n=120 である。②コハナヤスリより小形の胞子をつける。③根茎が多少とも塊状になる。④栄養葉の2次脈がほとんど発達しない。⑤植物体はたいそう小さく，葉は鋭先形となる。⑥担葉体が短かく，したがって葉身が地表に接している，などの特徴から新種 *Ophioglossum parvum* として取扱う。東邦大の佐橋紀男氏が青ケ島で採集された小型のハナヤスリも，同氏の好意による検討の結果，同一種であることが判明した。

なおこの植物は1905年に川崎光次郎氏により伊勢四日市で採集されたハナヤスリ［牧野標本館 No. 116-6 (4110)］と同一と思われ，これには同氏によりチャボハナヤスリなる和名が付記されている。また牧野富太郎氏はこのタイプのものをヒメハナヤスリと呼んでいたようであるが正式の報告はない。したがって，志村義雄氏がエンシュウハナヤスリと仮称してきたこの植物の和名として，川崎氏のいうチャボハナヤスリを採用するものである。

□三浦宏一郎・徳増征二（訳）：**菌類と人間** (Cooke, R. C.: Fungi, man and environment) 249 pp. 1980. 共立出版，東京. ¥1,600. 共立科学ブックス44。生物界の大群である菌類について，その生活，他の動植物とくに人間との関わりを幅広く紹介し，菌類が何を行ない，いかにわれわれにとって重要であり，いかに現在研究されているかを述べた本である。どの項目にも豊富な話題が巧みに述べられていて，私のような菌類に弱い者にとってもまことに興味しんしんたるものがある。訳者はそれぞれ専門の菌学者であり，訳文は読みやすく理解しやすい。内容の輪郭を紹介する意味で，次に各項目の表題を掲げる。1. 新しい生物界。2. 菌類の栄養物質と生態的地位。3. 作物の菌類病。4. 共生関係と二重生物。5. ヒトや家畜の真菌症。6. 生物農薬としての菌類。7. 菌類と昆虫の不思議な共同生活。8. キノコ毒とカビ毒。9. 菌体蛋白質の利用と加工食品。10. 魔法のキノコと幻覚剤。 （伊藤 洋）